INTRODUCTORY REMARKS TO M-518 MULTIPURPOSE FURNACE EXPERIMENTS PERFORMED ON SKYLAB

By

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Ladies and gentlemen, it is indeed a pleasure to chair this portion of the symposium. Our next eleven presenters are Principal Investigators of Materials Processing Experiments in the M518, Multipurpose Furnace System, on the Skylab Program. Working with each of them over the past two years has been very pleasant and a personally rewarding experience. They have been invited here today to discuss the objectives, mechanics and scientific results of their individual experiments. Before introducing the first speaker, I'd like to take just a few minutes to familiarize you with the M518 Furnace Facility. This information will allow each speaker to go immediately into the details of his experiment without having to discuss general design and facility aspects.

Each investigator was asked to construct his desired sample materials to mutually agreed to dimensions. The material was then encapsulated in Quartz or a suitable metal sheath. This sample ampoule was then shipped to the Westinghouse Laboratories in Pittsburgh, our general contractor for the entire M518 experiment system, who chose suitable thermal inserts (conductors and resistors) required to establish a thermal gradient across the cartridge, in a manner suitable to the Principal Investigator. This entire system was then enclosed in stainless steel tubes, all having the same exterior dimensions. As you can readily see, the cartridge system presents a simple and clean interface between the facility and the highly varied experiments.

Each experiment was initiated by a Skylab astronaut inserting three cartridges, comprising a set for each experiment, into the M518 Furnace. Upon insertion, the cartridges became an integral part of the furnace design. Space vacuum was utilized to prevent convective heat transfer; therefore, radiative heating of the end of the cartridge located near the heater element was then conducted through the cartridges to the heat sink located at the other end of the furnace. Generally speaking, the total heat generated by the furnace flowed through the experiment cartridges at a rate which was dependent upon the thermal impedance of the individual cartridge designs. The desired parameters, maximum heat leveler temperature, time duration at max temperature, and rate of cartridge cool down, were "dialed in" by the astronaut on the facility control device. (These specific parameters were, of course, established through extensive ground testing.)

All mechanical aspects of the experiment system went well. All eleven experiment sets were processed during the second Skylab mission, and seven of the eleven were repeated during the third mission using the so-called "flight backup" cartridges. These repeat operations were for additional data. The previously unanticipated opportunity came as a result of time line openings which were generated by the crew members operating even more efficiently than planned. Some of the experiments were processed at identical parameters to the first operation, and some utilized modified operational parameters depending on individual Principal Investigator preference.

The facility functioned flawlessly and the thermal designs of the individual experiment cartridges apparently accomplished the desired thermal mechanics. The overall project results will be reflected in the interesting presentations to follow.